(19) World Intellectual Property Organization International Bureau



(43) International Publication Date 18 October 2001 (18.10.2001)

PCT

(10) International Publication Number WO 01/77487 A3

(51) International Patent Classification⁷: E21B 43/25, 43/26, 37/06, 43/27

(21) International Application Number: PCT/EP01/03832

(22) International Filing Date: 3 April 2001 (03.04.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

60/194,755 5 April 2000 (05.04.2000) US 60/211,684 15 June 2000 (15.06.2000) US

- (71) Applicant (for all designated States except AM, AT, AZ, BY, CA, DE, DK, FR, GB, HR, IT, JP, KG, KR, KZ, MD, NL, NO, NZ, PL, RO, RU, TJ, TM, UA, ZA): SOFITECH N.V. [BE/BE]; 140, rue de Stalle, B-1180 Brussels (BE).
- (71) Applicant (for FR only): SERVICES PETROLIERS SCHLUMBERGER [FR/FR]; 42, rue Saint Dominique, F-75007 Paris (FR).
- (71) Applicant (for CA only): SCHLUMBERGER CANADA LIMITED [CA/CA]; Eau Claire Place I, 525 - 3rd Avenue, SW, Calgary, Alberta T2P 0G4 (CA).
- (71) Applicant (for AM, AT, AZ, BY, DE, DK, HR, IT, KG, KR, KZ, MD, NO, NZ, PL, RO, RU, TJ, TM, UA, ZA only): SCHLUMBERGER TECHNOLOGY B.V. [NL/NL]; Parkstraat 83-89, NL-2514 J The Hague (NL).
- (71) Applicant (for GB, JP, NL only): SCHLUMBERGER HOLDINGS LIMITED [--/--]; P.O. Box 71, Craigmuir Chambers, Road Town, Tortola (VG).
- (72) Inventors: NELSON, Erik, B.; 10610 Willowisp Drive, Houston, TX 77035 (US). LUNGWITZ, Bernhard; 10502 Fountain Lake Drive, No. 1237, Stafford, TX 77477 (US). DISMUKE, Keith; 2230 Long Cove Circle, Katy,

TX 77450 (US). SAMUEL, Mathew; Mukkuttumannil, Mathra P.O., Punalur, Kerala (IN). HUGHES, Trevor, L.; 5 St. Margaret's Square, Cambridge, Cambridgeshire CB1 4AP (GB). PARRIS, Michael; 36 East Kitty Hawk, Richmond, TX 77469 (US). SALAMAT, Golchi; 10498 Fountain Lake Drive, No. 125, Stafford, TX 77477 (US). LEE, Jesse, C.; 5519 Chesapeake Place, Sugar Land, TX 77479 (US). FLETCHER, Philip; 3000 Bissonnette Street, No. 6305, Houston, TX 77005 (US). FU, Diankui; 1819 Brightlake Way, Missouri City, TX 77459 (US). HUTCHINS, Richard; 17507 Sunny Trail Lane, Sugar Land, TX 77479 (US). TUSTIN, Gary, J.; 8 Carrick Close, Cambridge, Cambridgeshire CB1 8RQ (GB).

- (74) Agents: MENES, Catherine et al.; Etudes et Productions Schlumberger, IP Department, 1, rue Becquerel, BP 202, F-92140 Clamart (FR).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- (88) Date of publication of the international search report: 28 March 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

i

(54) Title: VISCOSITY REDUCTION OF VISCOELASTIC SURFACTANT BASED FLUIDS

(57) Abstract: Methods and compositions are disclosed for controlled addition of components that decrease the viscosity of the viscoelastic surfactant fluids or for controlled changes in the electrolyte concentration or composition of the viscoelastic surfactant fluids. One aspect of the invention relates to the use of internal breakers with a delayed activation. Another aspect of the invention relates to the use of precursors that release a breaking system such as alcohol by a process such as melting, slow dissolution, reaction with a compound present in the fluid or added to the fluid during or after the step of injecting, rupture of an encapsulating coating and de-adsorption of a breaking agent absorbed into solid particles. In another aspect of the invention, alcohols are included in a pad to reduce the low-shear viscosity and reduce the resistance to flow of the treatment fluids during a desired phase of the treatment.

INTERNATIONAL SEARCH REPORT

PC I/EP 01/03832

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E21B43/25 E21B E21B43/26 E21B43/27 E21B37/06 According to International Patent Classification (IPC) or to both national classification and IPC Minimum documentation searched (classification system followed by classification symbols) IPC 7 E21B Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal C. DOCUMENTS CONSIDERED TO BE RELEVANT Relevant to daim No. Citation of document, with indication, where appropriate, of the relevant passages Y WO 92 10640 A (WESTERN CO OF NORTH 1-3,24,27,28 AMERICA) 25 June 1992 (1992-06-25) page 2, line 25 -page 3, line 15 page 7, line 5 - line 18 page 8, line 29 - line 35 page 12, line 4 - line 26 page 14, line 7 - line 21 1-3,5-7,WO 92 12328 A (EXXON RESEARCH ENGINEERING Y 24,27, CO) 23 July 1992 (1992-07-23) 28,30,31 page 2, line 5 -page 3, line 6 page 4, line 1 - line 8 page 9, line 17 - line 27 page 11, line 17 - line 21 page 12, line 22 -page 3, line 5; claims 1,7,8 -/--Patent family members are listed in annex. Further documents are listed in the continuation of box C. X Special categories of cited documents: "T" later document published after the international filing date or priority date and not in conflict with the application but *A* document defining the general state of the art which is not considered to be of particular relevance cited to understand the principle or theory underlying the invention "E" earlier document but published on or after the international "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to filing date involve an inventive step when the document is taken alone "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such docucitation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or ments, such combination being obvious to a person skilled other means document published prior to the international filing date but later than the priority date claimed in the art. *&* document member of the same patent family Date of the actual completion of the international search Date of mailing of the international search report 21/12/2001 12 December 2001 Authorized officer Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl. Boulon, A Fax: (+31-70) 340-3016

1

INTERNATIONAL SEARCH REPORT

Inte ional Application No

		PC:/EP 01/03832		
	ation) DOCUMENTS CONSIDERED TO BE RELEVANT			
Category "	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
Y	US 4 741 401 A (WALLES WILHELM E ET AL) 3 May 1988 (1988-05-03) column 1, line 23 - line 65 column 2, line 45 -column 3, line 27 column 5, line 18 - line 62 column 7, line 36 -column 8, line 33	1-3,6, 24,27,28		
Υ	WO 98 56497 A (RHODIA INC) 17 December 1998 (1998-12-17) page 5, line 19 -page 6, line 8 page 11, line 19 - line 35	1,5-7, 24,26, 27,30,31		
X	page 13, line 3 - line 9 page 13, line 24 - line 36; claims 1,5,8-10	22		
X	US 5 551 516 A (NORMAN WILLIAM D ET AL) 3 September 1996 (1996-09-03) column 6, line 35 -column 8, line 65 column 10, line 21 - line 26; claims 1,2; example 1	22,23		
Υ	WO 99 24693 A (WHALEN ROBERT T)	1,24,26		
X	20 May 1999 (1999-05-20) page 5, line 15 - line 19 page 7, line 7 - line 22 page 11, line 18 -page 12, line 2; claims 1,2,15,17	22		
	P * * **** == == == == == == == == == = = = = = =			
-				
		·		
į				
		İ		

1

INTERNATIONAL SEARCH REPORT

.nformation on patent family members

Inter Nonal Application No

	atent document d in search report		Publication date		Patent family member(s)	Publication date
WO	9210640	Α	25-06-1992	US	5164099 A	17-11-1992
				ΑT	152500 T	15-05-1997
				DE	69125945 D1	05-06-1997
				DK	5 59 783 T3	03-11-1997
				EP	0559783 A1	15-09-1993
				NO	303650 B1	10-08-1998
				WO	9210640 A1	25-06-1992
WO	9212328	Α	23-07-1992	US	5102559 A	07-04-1992
				CA	2098620 A1	05-07-1992
				EP	0585228 A1	09-03-1994
				NO	932426 A	01-09-1993
				WO	9212328 A1	23-07-1992
				US	5204183 A	20-04-1993
US	4741401	Α	03-05-1988	AU	582320 B2	16-03-1989
				AU	1023188 A	25-08-1988
				BR	8800186 A	30-08-1988
				CA	1274767 A1	02-10-1990
				CN	88100379 A ,E	
				GB	2199872 A ,E	
				IN	170553 A1	11-04-1992
				MX	172677 B	07-01-1994
			*	NO	177199 B	24-04-1995
WO	9856497	Α	17-12-1998	AU	8066298 A	30-12-1998
				CN	1263481 T	16-08-2000
				EP	0993334 A1	19-04-2000
				NO	996089 A	08-02-2000
				US	6258859 B1	10-07-2001
				WO	9856497 A1	17-12-1998
US	5551516	A	03-09-1996	NONE		
WO	9924693	Α.	20-05-1999	US	6035936 A	14-03-2000
				AU	1311899 A	31-05-1999
				DE	1029149 T1	05-04-2001
				EP	1029149 A1	23-08-2000
				WO	9924693 A1	20-05-1999